SCIENCE EDUCATION

VOLUME 63
1979

EDITOR
Leopold E. Klopfer

published by JOHN WILEY & SONS
an Interscience® Publication

Copyright © 1979 by JOHN WILEY & SONS, INC.

Special Section Editors:

Science Teacher Education—Patricia E. Blosser
Issues & Trends—Leopold E. Klopfer
International Science Education—Fletcher G. Watson
Learning—Joseph D. Novak

Editorial Board:

Betsy A. Balzano
Patricia E. Blosser
Audrey B. Champagne
Robert W. Howe
Joseph D. Novak
James R. Okey
Ronald J. Raven
John P. Smith
Fletcher G. Watson

Editor Emeritus: N. E. Bingham

The **Science Teacher Education Section** is sponsored by the Association for the Education of Teachers in Science (AETS). The Editorial Review Board of AETS is composed of

Hans O. Andersen (1980)
Ronald D. Anderson (1981)
Jean Beard (1980)
Patricia E. Blosser (1981)
Harold H. Jaus (1979)
Frances Lawrenz (1980)
James A. Shymansky (1979)
Paul Westmeyer (1981)
Marvin F. Wideen (1979)

Published five times yearly (January, April, July, September, October), one volume per year, by John Wiley & Sons, Inc. Copyright © 1979 by John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016. All rights reserved. Reproduction or translation of any part of this work beyond that permitted by Sections 107 or 108 of the United States Copyright Law without the permission of the Copyright holder is unlawful. Second-class postage paid at New York, New York, and at additional mailing offices.

The code and the copyright notice appearing at the bottom of the first page of an article in this journal indicate the copyright owner's consent that copies of the article may be made for personal or internal use, or for the personal or internal use of specific clients, on the condition that the copier pay for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. The per-copy fee for each article appears after the dollar sign and is to be paid through the Copyright Clearance Center, Inc. This consent does not extend to other kinds of copying, such as copying for general distribution, for advertising or promotional purposes, for creating new collective works, or for resale. Such permission requests and other permission inquiries should be addressed to the publisher.

Subscription price: $30.00 per volume. Postage and handling outside U.S.A.: $8.00. Please allow four weeks for change of address. Back volumes, microfilm, and microfiche available for previous years. Request price list from publisher. Claims for undelivered copies must be made no later than three months following month of publication. Missing copies will be supplied when losses have been sustained in transit and where reserve stock will permit.

Manuscripts should be submitted in triplicate to Dr. Leopold E. Klopfer, Editor, University of Pittsburgh, Learning Research and Development Center, 3939 O'Hara Street, Pittsburgh, Pennsylvania 15260. All other correspondence should be addressed to Journals Department, John Wiley & Sons, Inc., 605 Third Avenue, New York, New York 10016.

The Contents of Science Education are indexed in the *Education Index*, in *Current Index to Journals in Education*, in *Research into Higher Education Abstracts*, and in *divice*.

Science Education
Volume 63, 1979

Issue 1, January

In Appreciation: N. Eldred Bingham, *Editor Emeritus*
L. E. Klopfer 1

ISEE-ITV and Professional Reinforcement: A Teacher's Model for Implementing Curriculum Change at the District Level
R. L. Shrigley, T. Johnson, D. Wolfinger, and C. Maria 3

Evaluation of the Effect of Laboratory-Oriented Science Curriculum Materials on the Attitudes of Students with Reading Difficulties
J. L. Milson 9

Reading and Reasoning in ISCS Classes
A. C. Howe and M. Early 15

Summative Evaluation of a Participatory Science Exhibit
C. I. Sneider, L. P. Eason, and A. J. Friedman 25

Effects of Reduced Reading Level on Achievement in ISCS
C. E. Greene and M. Szabo 37

SCIENCE TEACHER EDUCATION

Effect of a Four-Year Elementary Teacher Preparation Program on Undergraduates' Preferences for Teaching Science
G. E. Downs and F. P. DeLuca 45

Evaluation Design Elements for the Development and Implementation of Preservice Preparation for Elementary School Teachers in Science
M. Kagan and H. Harty 53

LEARNING

Instruction of Fourth Grade Girls and Boys on Spatial Visualization
W. S. Smith and C. K. Schroeder 61

Combining Variables, Controlling Variables, and Proportions: Is There a Psychological Link?
A. E. Lawson 67

Syntactical Complexity in Written Language and Cognitive Development at the Formal Level
A. E. Lawson and G. D. Shepherd 73

Children's Conceptions of the Earth as a Cosmic Body: A Cross Age Study
J. Nussbaum 83

ISSUES & TRENDS

Science Education and the Emerging Ecological Society
R. W. Bybee 95

On the Distortion of the History of Science in Science Education
H. Siegel 111

INTERNATIONAL SCIENCE EDUCATION

Science Education in the People's Republic of China: Observations and Impressions
F. Swetz 119

COMMENTS AND CRITICISM

Two Notes of Interest to Science Educators: I. Compendium of Curriculum Development Projects; II. Worldwatch Institute Publications
N. E. Bingham 131

Can Ausubel's Theory of Meaningful Learning Become an Alternative to Piagetian Psychology?
E. Albert 135

COMMENTS FROM THE SCIENCE EDUCATION DIRECTORATE, NATIONAL SCIENCE FOUNDATION

Focus on Early Adolescence: A New Emphasis for the Science Education Directorate
C. Katzenmeyer 139

Issue 2, April

Editorial—A New Style for Citations and References
L. E. Klopfer 143

Pioneers of Elementary School Science: I. Wilbur Samuel Jackman
A. B. Champagne and L. E. Klopfer 145

An Untangled Web to Weave
A. W. Strickland, III and K. Lucas 167

Study of the Cognitive Structures of Unified and Subject-Centered Science Students and those of their Teachers
W. Toews 173

Working with Values and Moral Issues in Content-Centered Science Classrooms
R. J. Stahl 183

Use of Systematic Observations to Improve College Science Laboratory Instruction
J. A. Shymansky and J. E. Penick 195

SCIENCE TEACHER EDUCATION

Can Secondary Science Teachers Learn to Increase the Commonality of their Lectures?
W. G. Lamb and P. C. Davis 205

LEARNING

Written Piagetian Task Instrument: Its Development and Use
R. A. Walker, J. R. Hendrix, and T. R. Mertens 211

Children's Conceptions of Heat and Temperature
G. L. Erickson 221

Formal Operational Precocity and Achievement in Biology among Some Nigerian High School Students
O. J. Ehindero 231

ISSUES & TRENDS

Mastery Methods: Meeting the Challenge of Individual Differences in Secondary Science Instruction
M. Grabe, R. M. Latta, and W. Dolphin 237

Science Education Policies for an Ecological Society: Aims and Goals
R. W. Bybee 245

INTERNATIONAL SCIENCE EDUCATION

Science, Curriculum, and Society: Trends in Science Curriculum
N. Sabar 257

COMMENTS AND CRITICISM

Response to "Can Ausubel's Theory of Meaningful Learning Become an Alternative to Piagetian Psychology?"
J. D. Novak 271

Comments on "Science Education in the People's Republic of China: Observations and Impressions"
R. W. Tyler 275

Comments on "On the Distortion of the History of Science in Science Education"
S. G. Brush 277

COMMENTS FROM THE SCIENCE EDUCATION DIRECTORATE, NATIONAL SCIENCE FOUNDATION

Joint NIE–NSF Reasearch Program: Report at the End of the First Year
E. McWilliams 279
Information for Contributors 283

Issue 3, July

A General Theory of Instruction With References to Science
P. F. Brandwein 285

Pioneers of Elementary-School Science: II. Anna Botsford Comstock
A. B. Champagne and L. E. Klopfer 299

Apprenticeship in American Science, 1800–1876: A Critique of an Educative Model
L. B. Arnold 323

Five Years of Evaluating Federal Programs—Implications for the Future
W. W. Welch 335

Utilizing Science Activities to Remediate Communications Deficiencies Identified by the Florida State Assessment Testing Program
W. K. Esler, B. Anderson, and V. Anderson 345

SCIENCE TEACHER EDUCATION

Analysis System for Describing and Measuring Strategies of Teaching Data Manipulation and Interpretation
R. H. Yeany and W. Capie 355

Enhancing Student-Teachers' Analytical Perception of Science Lessons
A. Dreyfus and H. Cohen 363

Science Education in Small and Large Institutions: Problems and Solutions
E. D. McKenna, R. W. Bybee, L. Smigelski, and C. E. Stellwagen 373

LEARNING

Effect of Intensive Instruction in Cue Attendance on Solving Formal Operational Tasks
E. L. Wright 381

Content and Cognitive Structure: Critique of Assessment and Representation Techniques Used by Science Education Researchers
J. Stewart 395

ISSUES & TRENDS

Survey of Science Education in a Sample of Illinois Schools: Grades K–6 (1975–1976)
T. Fitch and R. Fisher 407

COMMENTS FROM THE SCIENCE EDUCATION DIRECTORATE, NATIONAL SCIENCE FOUNDATION

Peer Review of Science Education Proposals at the National Science Foundation
W. A. Blanpied and A. F. Borg 417
Information for Contributors 423

Issue 4, September

A Summary of Research in Science Education—1977

FOREWORD 425

PREFACE 427

ACKNOWLEDGMENTS 428

INTRODUCTION
Objectives 429
Organization and Features 430

OVERVIEW
Introduction 433
Philosophy 433
Goals, Objectives and Priorities 434
Status of Research in Science Education 435

EX POST FACTO AND SURVEY RESEARCH
Introduction 437
MATRIX 1 439
Students 440
Teachers and Others 453
Surveys about Elementary and Secondary Science Education Programs 459

EXPERIMENTAL RESEARCH
Introduction 465
MATRIX 2 466
Students 467
Teachers 488

CONCLUSIONS
Introduction 492
Cognitive Development 492
Achievement 495
Attitudes and Perceptions 497
Instruction 501
Implications for Teachers 504
Implications for Researchers 505

REFERENCES 512

APPENDIX A: Other Papers 548

APPENDIX B: International References of Research in Science Education 549

APPENDIX C: Abstracts Pertaining to Science Education from U.S.S.R. 551

Issue 5, October

In Appreciation
L. E. Klopfer 555

Pioneers of Elementary-School Science: III. Ephraim Laurence Palmer
A. B. Champagne and L. E. Klopfer 557

Students' Interests in Specific Science Topics
R. J. Sullivan 591

Simulating Scientific Inquiry with the Card Game Eleusis
H. C. Romesburg 599

Study of the Attitudes of Secondary School Students toward Energy-Related Issues
D. J. Kuhn 609

Topic of Evolution in Secondary School Biology Textbooks: 1900–1977
G. Skoog 621

SCIENCE TEACHER EDUCATION

Alternative Graduate Program in Science Education
L. W. Trowbridge and J. H. Dech 641

Investigation of Children's Attitudes toward Science Fostered by a Field-Based Science Methods Course
L. E. Story and I. D. Brown 649

Effects of Science Methods Courses with and without Field Experience on Attitudes of Preservice Elementary Teachers
H. M. Weaver, P. B. Hounshell, and C. B. Coble 655

LEARNING

Spatial Visualization, Problem Solving, and Cognitive Development in Freshman Teacher Education Students
D. M. Hill and P. A. Obenauf 665

Early Adolescent Girls' and Boys' Learning of a Spatial Visualization Skill
W. S. Smith and C. I. Litman 671

Cognitive Analysis of Physics Textbooks at the Tertiary or College Level
M. Prosser 677

Development of Earth and Gravity Concepts among Nepali Children
G. B. Mali and A. Howe 685

INTERNATIONAL SCIENCE EDUCATION

Curriculum Adaptation in Science Education: Why and How
A. Blum 693

Problems in the Adaptation of Nonformal Study Programs to the Israeli Educational System
B. Chen, J. Orr, and H. D. Thier 705

COMMENTS AND CRITICISM

Comments on Piaget's Concept of Abstraction
W. E. Lowell 715

Editorial Comments on "Development of Earth and Gravity Concepts among Nepali Children"
J. D. Novak 719

COMMENTS FROM THE SCIENCE EDUCATION DIRECTORATE, NATIONAL SCIENCE FOUNDATION

College Faculty-Oriented Programs of the National Science Foundation
E. J. Kormondy 721

Author Index 727

Information for Contributors 731

Volume Title Page i

Volume Contents iii

Statement of Ownership, Management and Circulation
(Required by 39 U.S.C. 3685)

1. Title of publication: Science Education
2. Date of filing: 6 September 1979
3. Frequency of publication: Five times yearly
   A. Number of issues published annually: five
   B. Annual subscription price: $30.00
4. Location of known office of publication: John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016
5. Location of the headquarters or general business offices of the publishers: John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016
6. Publisher: John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016
   Editor: Leopold E. Klopfer, University of Pittsburgh, Pittsburgh, PA 15260
   Managing Editor: None
7. Owner: John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016

   The following is a list of stockholders owning or holding one percent or more of John Wiley & Sons, Inc. stock as of August 1979: Cynthia W. Darby, Box 651, Bridgehampton, NY 11932; Hamilton Darby, Box 651, Bridgehampton, NY 11932; D. W. Grout, W. B. Wiley II, & P. B. Wiley, Executors of the Estate of Edward P. Hamilton, c/o Gifford, Woody, Palmer & Searles, 14 Wall Street, New York, NY 10005; W. Bradford Wiley & Deborah Wiley Grout, Trustees, Elizabeth W. Hamilton Trust, 605 Third Avenue, New York, NY 10016; Morgan Guaranty Trust & W. B. Wiley, Trustees under will of Elizabeth Wiley Hamilton, c/o Morgan Guaranty Trust Co., P.O. Box 491, Church St. Station, New York, NY 10008; Jenny R. Proskauer, P.O. Box 238, Church St. Station, New York, NY 10008; W. Bradford Wiley & Peter Booth Wiley, Trustees, f/b/o Deborah Elizabeth Wiley Grout, c/o John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016; Cynthia W. Darby & Julia Gilbert, Trustees under will of Kate Q. Wiley, Gifford, Woody, Palmer & Searles, 14 Wall Street, New York, NY 10005; W. Bradford Wiley & W. Bradford Wiley II, Trustees, f/b/o Peter Booth Wiley, 605 Third Avenue, New York, NY 10016; W. Bradford Wiley & Deborah Wiley Grout, Trustees, f/b/o William Bradford Wiley II, c/o John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10016; Hamilton D. Darby & Cynthia Wiley Darby, Trustees under will of William O. Wiley, c/o Gifford, Woody, Palmer & Searles, 14 Wall Street, New York, NY 10005; Adele E. Windheim, 8 Dundee Road, Larchmont, NY 10538; Mrs. Rosamond R. Pennywitt, 49 Bristol Place, Bay Head, NJ 08742; Bankers Trust Company, 16 Wall Street, New York, NY 10005; National Bank of Detroit, Woodward Avenue, Detroit, MI; Bank of New York, P.O. Box 11 203, New York, NY 10049; Morgan Guaranty Trust Company, 23 Wall Street, New York, NY 10005; Bradford Trust Company, 95 Wall Street, New York, NY 10005; Midland National Bank, 401 Second Avenue South, Minneapolis, MN 55480; W. Bradford Wiley, 605 Third Avenue, New York, NY 10016.

8. Known bondholders, mortgagees, and other security holders owning or holding one percent or more of the total amount of bonds, mortgages, or other securities: None
10. Extent and nature of circulation

	Average number of copies of each issue during preceding 12 months	Actual number of copies of single issue published nearest to filing date
A. Total number of copies printed	2300	2300
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales	none	none
2. Mail subscriptions	1998	1990
C. Total paid circulation	1998	1990
D. Free distribution by mail, carrier or other means, samples, complimentary, and other free copies	34	34
E. Total distribution	2032	2024
F. Copies not distributed		
1. Office use, left over, unaccounted, spoiled after printing	268	276
2. Returns from news agents	none	none
G. Total	2300	2300

11. I certify that the statements made by me above are correct and complete.

Allan Wittman, *Publisher*

12. For completion by publishers mailing at the regular rates: 39 U. S. C. 3626 provides in pertinent part: "No person who would have been entitled to mail matter under former section 4359 of this title shall mail such matter at the rates provided under this subsection unless he files annually with the Postal Service a written request for permission to mail matter at such rates." In accordance with the provisions of this statute, I hereby request permission to mail the publication named in Item 1 at the phased postage rates presently authorized by 39 U. S. C. 3626.

Allan Wittman, *Publisher*

Author Index to Volume 63

Albert E.: Can Ausubel's Theory of Meaningful Learning Become an Alternative to Piagetian Psychology?, 135
Anderson, B.: See Esler, W. K.
Anderson, V.: See Esler, W. K.
Arnold, L. B.: Apprenticeship in American Science, 1800–1876: A Critique of an Educative Model, 323

Bingham, N. E.: Two Notes of Interest to Science Educators: I. Compendium of Curriculum Development Projects; II. Worldwatch Institute Publications, 131
Blanpied, W. A. and Borg, A. F.: Peer Review of Science Education Proposals at the National Science Foundation, 417
Blum, A.: Curriculum Adaptation in Science Education: Why and How, 693
Borg, A. F.: See Blanpied, W. A.
Brandwein, P. F.: A General Theory of Instruction, With References to Science, 285
Brown, I. D.: See Story, L. E.
Brush, S. G.: Comments on "On the Distortion of the History of Science in Science Education," 277
Bybee, R. W.: Science Education and the Emerging Ecological Society, 95
——: Science Education Policies for an Ecological Society: Aims and Goals, 245
——: See McKenna, E. D.

Capie, W.: See Yeany, R. H.
Carlson, G. R.: See Peterson, R. W.
Champagne, A. B. and Klopfer, L. E.: Pioneers of Elementary School Science: I. Wilbur Samuel Jackman, 145
—— and ——: Pioneers of Elementary-School Science: II. Anna Botsford Comstock, 299
—— and ——: Pioneers of Elementary-School Science: III. Ephraim Laurence Palmer, 557
Chen, B., Orr, J., and Thier, H. D.: Problems in the Adaptation of Nonformal Study Programs to the Israeli Educational System, 705
Coble, C. B.: See Weaver, H. M.
Cohen, H.: See Dreyfus, A.

Davis, P. C.: See Lamb, W. G.
Dech, J. H.: See Trowbridge, L. W.
DeLuca, F. P.: See Downs, G. E.
Dolphin, W.: See Grabe, M.
Downs, G. E. and DeLuca, F. P.: Effect of a Four-Year Elementary Teacher Preparation Program on Undergraduates' Preferences for Teaching Science, 45
Dreyfus, A. and Cohen, H.: Enhancing Student-Teachers' Analytical Perception of Science Lessons, 363

Early, M.: See Howe, A. C.
Eason, C. I.: See Sneider, C. I.
Ehindero, O. J.: Formal Operational Precocity and Achievement in Biology among Some Nigerian High School Students, 231
Erickson, G. L.: Children's Conceptions of Heat and Temperature, 221
Esler, W. K., Anderson, B., and Anderson, V.: Utilizing Science Activities to Remediate Communications Deficiencies Identified by the Florida State Assessment Testing Program, 345

Fisher, R.: See Fitch, T.
Fitch, T. and Fisher, R.: Survey of Science Education in a Sample of Illinois Schools: Grades K–6 (1975–1976), 407
Friedman, A. J.: See Sneider, C. I.

Grabe, M., Latta, R. M., and Dolphin, W.: Mastery Methods: Meeting the Challenge of Individual Differences in Secondary Science Instruction, 237
Greene, C. E. and Szabo, M.: Effects of Reduced Reading Level on Achievement in ISCS, 37

Harty, H.: See Kagan, M.
Hendrix, J. R.: See Walker, R. A.
Hill, D. M. and Obenauf, P. A.: Spatial Visualization, Problem Solving, and Cognitive Development in Freshman Teacher Education Students, 665
Hounshell, P. B.: See Weaver, H. M.
Howe, A. C. and Early, M.: Reading and Reasoning in ISCS Classes, 15
Howe, A.: See Mali, G. B.

Johnson, T.: See Shrigley, R. L.

Kagan, M. and Harty, H.: Evaluation Design Elements for the Development and Implementation of Preservice Preparation for Elementary School Teachers in Science, 53
Katzenmeyer, C.: Focus on Early Adolescence: A New Emphasis for the Science Education Directorate, 139
Klopfer, L. E.: In Appreciation: N. Eldred Bingham, *Editor Emeritus*, 1
——: Editorial—A New Style for Citations and References, 143
——: In Appreciation, 555
——: See Champagne, A. B.
Kormondy, E. J.: College Faculty-Oriented Programs of the National Science Foundation, 721
Kuhn, D. J.: Study of the Attitudes of Secondary School Students toward Energy-Related Issues, 609

Lamb, W. G. and Davis, P. C.: Can Secondary Science Teachers Learn to Increase the Commonality of their Lectures?, 205
Latta, R. M.: See Grabe, M.
Lawson, A. E.: Combining Variables, Controlling Variables, and Proportions: Is There a Psychological Link?, 67
—— and Shepherd, G. D.: Syntactical Complexity in Written Language and Cognitive Development at the Formal Level, 73
Litman, C. I.: See Smith, W. S.
Lowell, W. E.: Comments on Piaget's Concept of Abstraction, 715
Lucas, K.: See Strickland, III, A. W.

Mali, G. B. and Howe, A.: Development of Earth and Gravity Concepts among Nepali Children, 685
Maria, C.: See Shrigley, R. L.
McKenna, E. D., Bybee, R. W., Smigelski, L., and Stellwagen, C. E.: Science Education in Small and Large Institutions: Problems and Solutions, 373
McWilliams, E.: Joint NIE–NSF Research Program: Report at the End of the First Year, 279
Mertens, T. R.: See Walker, R. A.
Milson, J. L.: Evaluation of the Effect of Laboratory-Oriented Science Curriculum Materials on the Attitudes of Students with Reading Difficulties, 9

Novak, J. D.: Response to "Can Ausubel's Theory of Meaningful Learning Become an Alternative to Piagetian Psychology?," 271
——: Editorial Comments on "Development of Earth and Gravity Concepts among Nepali Children," 719
Nussbaum, J.: Children's Conceptions of the Earth as a Cosmic Body: A Cross Age Study, 83

Obenauf, P. A.: See Hill, D. M.
Orr, J.: See Chen, B.

Penick, J. E.: See Shymansky, J. A.
Peterson, R. W. and Carlson, G. R.: A Summary of Research in Science Education—1977, 429
Prossner, M.: Cognitive Analysis of Physics Textbooks at the Tertiary or College Level, 677

Romesburg, H. C.: Simulating Scientific Inquiry with the Card Game Eleusis, 599

Sabar, N.: Science, Curriculum, and Society: Trends in Science Curriculum, 257
Schroeder, C. K.: See Smith, W. S.
Shepherd, G. D.: See Lawson, A. E.
Shrigley, R. L., Johnson, T., Wolfinger, D., and Maria, C.: ISEE-ITV and Professional Reinforcement: A Teacher's Model for Implementing Curriculum Change at the District Level, 3
Shymansky, J. A. and Penick, J. E.: Use of Systematic Observations to Improve College Science Laboratory Instruction, 195
Siegel, H.: On the Distortion of the History of Science in Science Education, 111
Skoog, G.: Topic of Evolution in Secondary School Biology Textbooks: 1900–1977, 621
Smigelski, R. W.: See McKenna, E. D.
Smith, W. S. and Litman, C. I.: Early Adolescent Girls' and Boys' Learning of a Spatial Visualization Skill, 671
—— and Schroeder, C. K.: Instruction of Fourth Grade Girls and Boys on Spatial Visualization, 61
Sneider, C. I., Eason, L. P., and Friedman, A. J.: Summative Evaluation of a Participatory Science Exhibit, 25
Stahl, R. J.: Working with Values and Moral Issues in Content-Centered Science Classrooms, 183
Stellwagen, C. E.: See McKenna, E. D.
Stewart, J.: Content and Cognitive Structure: Critique of Assessment and Representation Techniques Used by Science Education Researchers, 395
Story, L. E. and Brown, I. D.: Investigation of Children's Attitudes toward Science Fostered by a Field-Based Science Methods Course, 649
Strickland, A. W., III and Lucas, K.: An Untangled

Web to Weave, 167
Sullivan, R. J.: Students Interests in Specific Science Topics, 591
Swetz, F.: Science Education in the People's Republic of China: Observations and Impressions, 119
Szabo, M.: See Greene, C. E.

Thier, H. D.: See Chen, B.
Toews, W.: Study of the Cognitive Structures of Unified and Subject-Centered Science Students and those of their Teachers, 173
Trowbridge, L. W. and Dech, J. H.: Alternative Graduate Program in Science Education, 641
Tyler, R. W.: Comments on "Science Education in the People's Republic of China: Observations and Impressions," 275

Walker, R. A., Hendrix, J. R., and Mertens, T. R.: Written Piagetian Task Instrument: Its Development and Use, 211
Weaver, H. M., Hounshell, P. B., and Coble, C. B.: Effects of Science Methods Courses with and without Field Experience on Attitudes of Preservice Elementary Teachers, 655
Welch, W. W.: Five Years of Evaluating Federal Programs—Implications for the Future, 335
Wolfinger, D.: See Shrigley, R. L.
Wright, E. L.: Effect of Intensive Instruction in Cue Attendance on Solving Formal Operational Tasks, 381

Yeany, R. H. and Capie, W.: Analysis System for Describing and Measuring Strategies of Teaching Data Manipulation and Interpretation, 355